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13. ABSTRACT The premise for the conference was that photonics is an emerging technology physics, chemistry, optics, and materials science for optical information a signal transmission and processing. The materials and phenomena of intere enable a variety of functions including optical frequency and amplitu modulation, parametric processes such as frequency conversion a amplification, switches between signal paths, analogue and digital computi functions, and a variety of signal processing functions.

The conference was organized into the following topical areas: 1) secc order nonlinear optics - materials, design, synthesis, fabricatic characterization, and processing into device structures, 2) third orc nonlinear optics - fundamental mechanisms, materials, processi applications, devices, 3) polymers in fiber optics - cladding, guidi properties, applications, 4) molecular assembly approaches - Langmuir Blodge and molecular self assembly as a means of controlling thin film architectu 5) polymers in microsensors.

The approach to the conference was informal, in the Gorden Conference sens to encourage open exchanges of information.

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May 19, 1992

Lt. Colonel L. Burggraf
Air Force Office of Scientific Research
AFOSR/NC
Bolling Air Force Base
Washington DC 20332-7448

Dear Colonel Burggraf:

In accordance with our discussion, this letter serves as the final technical report for grant #AFOSR-89-0452.

A proposal was submitted to Dr. Donald Ulrich early in 1989 requesting US Air Force support for a joint conference on Polymers in Photonics to be held at the 1989 International Chemical Conference of Pacific Basin Societies in Honolulu Hawaii from December 17-22. This meeting was the first joint US-Japan conference to exchange academic and precompetative research in this rapidly emerging area of science. The meeting was chaired jointly by Dr. Masao Kato from RIKEN, Professor John White from the Australian National University, and myself. The Symposium consisted of 23 invited participants, primarily from the US and Japan. Dr. Donald Ulrich of the AFOSR attended and was an active participant in the conference. A list of speakers and titles is attached.

The premise for the conference was that photonics is an emerging technology in physics, chemistry, optics, and materials science for optical information and signal transmission and processing. The materials and phenomena of interest enable a variety of functions including optical frequency and amplitude modulation, parametric processes such as frequency conversion and amplification, switches between signal paths, analogue and digital computing functions, and a variety of signal processing functions. It has been recognized in recent years that polymers containing molecularly engineered pi electronic systems exhibit extremely large second and third order nonlinear optical properties and with proper materials, optical, and

device engineering might be useful for many of the above mentioned applications. The ability to design and synthesize and process these materials into thin film formats and their compatibility with Si and compound semiconductor substrates might eventually lead to photonic technologies with significant commercial potential. The conference was therefore held to comprehensively explore the potential role of polymers in photonics.

The conference was organized into the following topical areas:

1. second order nonlinear optics - materials, design, synthesis, fabrication, characterization, and processing into device structures.

2. third order nonlinear optics - fundamental mechanisms, materials, processing, applications, devices.

3. polymers in fiber optics - cladding, guiding, properties, applications.

4. molecular assembly approaches - Langmuir Blodgett and molecular self assembly as a means of controlling thin film architecture.

5. polymers in microsensors

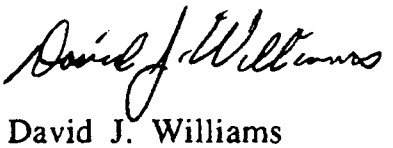
The approach to the conference was informal, in the Gorden Conference sense, to encourage open exchanges of information. For this reason formal publication of the proceedings was avoided. The abstracts of the paper were published in the Book of Abstracts - The 1989 International Chemical Congress of Pacific Basin Societies Part 1, Symposium 07G, papers 12-17, 40-45, 80-85, 136-140, 181-185.

The impact of the Symposium on future progress and communication within the international community conducting research in this area was considerable. Since that first joint US- Japan conference, regular exchanges of information have taken place between scientists and engineers in these countries. Very notable is the SPIE conference on Polymers in Nonlinear Optics which has become one of the largest and most popular of the conferences in this field. The lines of communication that were set up during that first conference greatly facilitated future exchanges of information.

From a more technical point of view the conference was also a success. Considerable scientific progress has been made in the development of materials and devices, particularly for second order nonlinear optical applications. The discussions of device related Figures of Merit were particularly useful since they established critical device related materials parameters that must be achieved before real applications could be found. Emphasis on high temperature performance to meet the military requirements has resulted in new initiatives and progress in that area. New materials, based on molecular assembly techniques have now shown impressive waveguide qualities and large figures of merit for second harmonic conversion. Good progress is also being made in the theory and development of new materials for third order nonlinear optics.

Finally, on behalf of the co-chairmen and myself I would like to express my gratitude to the AFOSR for their support of the conference. I believe that the exchanges of information and ideas had considerable benefit and stimulation to the participants, most of whom are leaders in this emerging field of research.

Sincerely yours,



David J. Williams

attachment

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Attachment

SYMPOSIUM ON POLYMERS IN PHOTONICS

AUTHOR	TITLE
T. J. Marks	Rational Design and Construction of Polymers with Very Large Optical Nonlinearities
M. Amano	Dye Substituted Polymers for Nonlinear Optics
S. Miyata	Design of Nonlinear Optical Materials of Guest-Host Systems
C. S. Willand	Molecular Hyperpolarizabilities of Molecules Containing Sulfone Electron Acceptors
J. E. Sohn	Thermally Crosslinked Poled Polymers for Nonlinear Optics
H. E. Katz	Conformationally Defined, Head-to-Tail Chromophore Oligomers for Second Order Nonlinear Optics: Dielectric and Solid State Characterization
A. F. Garito	Nonlinear Optical Processes in Lower Dimensional Conjugated Structures
P. M. Prasad	Studies of Third-Order Nonlinear Optical Effect in Sequentially Built and Systematically Derivatized Organic Structures
H. Nakanishi	New Polydiacetylenes for Nonlinear Optics
A. J. Heeger	Nonlinear Waveguides and Third Harmonic Generation From Conjugated Polymers
T. Wada	Molecular Design of Conjugated Systems for Nonlinear Optics

T. A. Skotheim	Langmuir-Blodgett Films of Poly(3-alkyl thiophenes) as Nonlinear Optical Materials
T. Kobayashi	Novel Method of Electro-Optic Constant Measurement
R. Lytel	Electro-optic Polymer Integrated Circuits
K. Horn	Polymeric Materials for Guided Wave Devices
T. Yoshimura	Enhancing Optical Nonlinearity by Controlling The Wave Function in Conjugated Systems
L.-T. Cheng	Structure-Property Relations for Molecular Hyperpolarizabilities
H. Ohkawa	Soluble Conjugated Polymers for Nonlinear Optical Waveguide
G. I. Stegeman	Progress in Power-Dependent Polymeric Waveguides
K. Sasaki	All Optical Bistability and Directional Coupling in Polydiacetylene Waveguides
L. Yu	Synthesis and Characterization of Rigid Rod/Flexible Chain Copolymers Exhibiting Large Optical Nonlinearities
A. Ulman	Molecular Self-Assembly of Films for Nonlinear Optics
M. Thakur	Toward Nonlinear Optical Device Applications of Polydiacetylenes
H. Matsuda	Approach to the Desired Orientation and the Desired Thickness of Organic Single Crystals for Nonlinear Optics
M. Kubo	Application of Pyrimidine Derivatives to Photoreversible Recording System

Q. Tran-Cong	Polarized Light-Induced Photochromic Reactions of Bichromophoric Molecules in Glassy Polymer Films
T. Ueda	Nonlinear Optical Properties of Ultra-Thin Films of Aromatic Polymers Synthesized at the Air-Water Interface
D. W. Polis	New Organic Copolymers Incorporating a Conjugated Electroactive Repeat Unit: Potential Nonlinear Optical Applications